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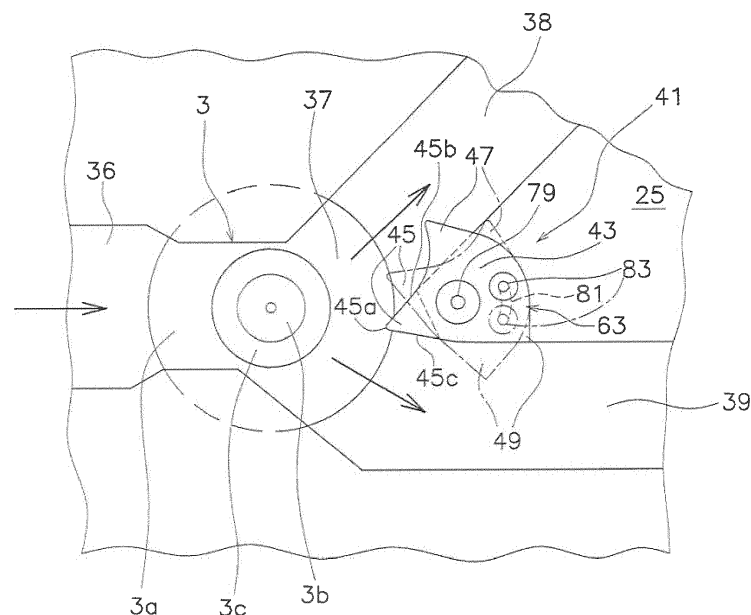
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(54) **CARRIER DISTRIBUTING DEVICE**

(57) The distributing member (41) can change its orientation between a first orientation (A) of guiding the carrier (3) to the first transportation path (38), and a second orientation (B) of guiding the carrier to the second transportation path (39). The distributing member (41) is changed from the first orientation (A) to the second ori-

entation (B) by the carrier (3) after guiding the carrier (3) to the first transportation path (38), and is changed from the second orientation (B) to the first orientation (A) by the carrier (3) after guiding the carrier (3) to the second transportation path (39).

FIG. 7



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a carrier distributing device that distributes a carrier used to transport a yarn supplying bobbin to two transportation paths, and particularly relates to a carrier distributing device that distributes a carrier with respect to two transportation paths extending toward two bobbin attaching units of a bobbin attaching device.

2. Description of the Related Art

[0002] Conventionally, there is known a bobbin transporting system that attaches a bobbin wound with a yarn to a carrier, and transports the carrier attached with the bobbin to supply the bobbin to a winding unit. There is also known a bobbin transporting system in which a spinning machine that spins a yarn is provided adjacent to an automatic winder, and the spinning machine and the automatic winder are directly connected with a transportation path.

[0003] A bobbin attaching device for attaching the bobbin to the carrier is arranged in the above-described bobbin transporting system.

[0004] Furthermore, a device that enhances the processing ability by arranging two bobbin attaching units, and distributing the transported carrier to each bobbin attaching unit is proposed for the bobbin attaching device (see EP 2465801 B1, for example).

[0005] The transportation path of the above-described bobbin transporting system includes a branched portion provided upstream in a transporting direction of the bobbin attaching device, two parallel transportation paths provided at positions corresponding to the two bobbin attaching units, and a merging portion provided downstream in the transporting direction of the bobbin attaching device. According to such a structure, the carriers are distributed from one transportation path to two transportation paths, and then are transported toward the bobbin attaching device.

BRIEF SUMMARY OF THE INVENTION

[0006] In order to exhibit the ability of the two bobbin attaching units of the bobbin attaching device to a maximum extent, the carriers are preferably distributed evenly to the two parallel transportation paths. However, EP 2465801 B1 only describes the arrangement of the two bobbin attaching units, and does not disclose a technique of evenly distributing the carriers to the two parallel transportation paths.

[0007] It is an object of the present invention to provide a carrier distributing device that evenly distributes a carrier used to transport a bobbin to two transportation paths.

[0008] A plurality of aspects will be hereinafter described as a means for achieving the object. Such aspects can be arbitrarily combined as necessary.

[0009] A carrier distributing device according to one aspect of the present invention is a device that distributes a carrier with respect to a bobbin attaching device including two bobbin attaching units, and includes a carrier transportation path and a distributing member.

[0010] The carrier transportation path includes a carrier introducing portion, a branched portion continuing to the carrier introducing portion, a first transportation path and a second transportation path branched from the branched portion and extended toward the two bobbin attaching units, and a merging portion where the first transportation path and the second transportation path merge.

[0011] The distributing member is a member arranged at the branched portion to distribute the carrier to the first transportation path and the second transportation path.

The distributing member can change an orientation between a first orientation of guiding the carrier to the first transportation path and a second orientation of guiding the carrier to the second transportation path. The distributing member is changed from the first orientation to the second orientation by the carrier after guiding the carrier to the first transportation path, and is changed from the second orientation to the first orientation by the carrier after guiding the carrier to the second transportation path.

[0012] In such a device, the carrier is moved from the carrier introducing portion to the branched portion, and alternately, that is, evenly distributed to the first transportation path and the second transportation path by the distributing member. The reason for alternately distributing the carrier is because the distributing member is changed from the first orientation to the second orientation after distributing the carrier to the first transportation path, and is changed from the second orientation to the first orientation after distributing the carrier to the second transportation path. Furthermore, the orientation of the distributing member is changed by the carrier to be transported. Therefore, a member (e.g., spring, solenoid) for driving the distributing member is not necessary. In other words, the distributing operation is achieved by a simple structure.

[0013] The distributing member may include a main body portion, a contact guiding portion, a first swing contacting portion, and a second swing contacting portion.

[0014] The main body portion is swingable.

[0015] The contact guiding portion is arranged on the main body portion, and makes contact with the carrier when the carrier approaches the distributing member from the carrier introducing portion, and thereafter, guides the carrier.

[0016] The first swing contacting portion is formed on the first transportation path side with respect to the contact guiding portion in the main body portion. When the carrier is brought into contact with the first contacting portion while the carrier is moving on the first transpor-

tation path in the first orientation, the distributing member is swung to change from the first orientation to the second orientation.

[0017] The second swing contacting portion is formed on the second transportation path side with respect to the contact guiding portion in the main body portion. When the carrier is brought into contact with the second contacting portion while the carrier is moving on the second transportation path in the second orientation, the distributing member is swung to change from the second orientation to the first orientation. In this device, the distributing member can distribute the carrier evenly to the first transportation path and the second transportation path by simply being swung between the first orientation and the second orientation.

[0018] The carrier may be movable to the second transportation path through the branched portion regardless of whether the distributing member is in the first orientation or the second orientation. When the carrier is stagnated in the first transportation path to stop in the vicinity of the branched portion, a transportation guide may be formed such that a next carrier is brought into contact with the stopped carrier and is guided to move to the second transportation path. In this device, when the carrier is stagnated in the first transportation path, the carrier is guided to the second transportation path. Therefore, the transportation efficiency of the carrier at the branched portion is less likely to lower.

[0019] The carrier distributing device may further include a first driving unit, a second driving unit, a carrier sensor, and a controller.

[0020] The first driving unit drives the first transportation path.

[0021] The second driving unit drives the second transportation path.

[0022] The carrier sensor detects a state of the carrier at the merging portion.

[0023] When determining that a bridge of the carrier has occurred at the merging portion according to a detection signal from the carrier sensor, the controller controls the first driving unit to move backward/stop the first transportation path, and when subsequently determining that the bridge of the carrier is resolved at the merging portion according to a detection signal from the carrier sensor, the controller controls the first driving unit to move forward the first transportation path.

[0024] In this device, when the bridge of the carrier occurs at the merging portion, the first transportation path is moved backward/stopped. When the bridge of the carrier at the merging portion is thereafter resolved, the first transportation path is moved forward. As a result, the bridge of the carrier at the merging portion is quickly resolved with a simple operation. That is, an alarm stop time is reduced.

[0025] The carrier distributing device may further include a first cutout device and a second cutout device arranged on the first transportation path and the second transportation path, respectively, to continuously exe-

cute stopping and releasing of forward movement on the carrier.

[0026] The controller cancels a cutout operation of the first cutout device and the second cutout device before backward moving/stopping the first transportation path or the second transportation path when determining that the bridge of the carrier occurred at the merging portion according to a detection signal from the carrier sensor, and starts the cutout operation of the first cutout device and the second cutout device after forward moving the first transportation path or the second transportation path. In this device, the cutout operation of the first cutout device and the second cutout device is canceled before the operation of resolving the bridge of the carrier at the merging portion is carried out. Therefore, a great number of carriers do not move toward the merging portion, and hence, the bridge of the carrier at the merging portion is reliably and quickly resolved.

[0027] According to one aspect, the distributing member is a plate-shaped piece. Therefore, a space occupied by the distributing member is small.

[0028] According to one aspect, a limiting mechanism that limits a swing angle of the distributing member is arranged. Therefore, the orientation of the distributing member is accurately maintained by limiting the swing angle of the distributing member.

[0029] According to one aspect, the contact guiding portion has a substantially triangular shape in plan view, and includes a distal end portion, a first receiving side on the first transportation path side, and a second receiving side on the second transportation path side. Therefore, the shape of the distributing member is simple.

[0030] According to one aspect, the carrier includes a circular column portion with a seating surface, on which the bobbin is seated, and an outer peripheral surface, to which the distributing member makes contact. Therefore, a general carrier can be used as it is.

[0031] According to one aspect, the carrier sensor detects whether or not a carrier is transported beyond the merging portion. Therefore, the controller can accurately determine whether the bridge of the carrier has occurred at the merging portion.

[0032] In the carrier distributing device according to the present invention, the carriers can be evenly distributed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033]

FIG. 1 is a schematic plan view showing an automatic winder system including a carrier distributing device according to one aspect of the present invention; FIG. 2 is a perspective view showing a carrier; FIG. 3 is a perspective view showing the carrier attached with a bobbin; FIG. 4 is a schematic cross-sectional view showing the carrier and the carrier distributing device;

FIG. 5 is a partial plan view showing a periphery of a branched portion;

FIG. 6 is a partial plan view showing the periphery of the branched portion;

FIG. 7 is a partial plan view showing the carrier distributing device;

FIG. 8 is a partial plan view showing a carrier distributing operation;

FIG. 9 is a partial plan view showing the carrier distributing operation;

FIG. 10 is a partial plan view showing the carrier distributing operation;

FIG. 11 is a partial plan view showing the carrier distributing operation;

FIG. 12 is a partial plan view showing the carrier distributing operation;

FIG. 13 is a partial plan view showing the carrier distributing operation;

FIG. 14 is a partial plan view showing the carrier distributing operation;

FIG. 15 is a partial plan view showing the carrier distributing operation;

FIG. 16 is a partial plan view showing the distributing operation of when the first transportation path is jammed;

FIG. 17 is a partial plan view showing the distributing operation of when the first transportation path is jammed;

FIG. 18 is a block diagram showing a control configuration of the carrier distributing device;

FIG. 19 is a flowchart showing a bridge resolving control of a merging portion of the carrier distributing device;

FIG. 20 is a partial plan view showing the bridge resolving operation at the merging portion;

FIG. 21 is a partial plan view showing the bridge resolving operation at the merging portion; and

FIG. 22 is a partial plan view showing the bridge resolving operation at the merging portion.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

1. First Embodiment

(1) Automatic winder system

[0034] An automatic winder system 101 according to one embodiment of the present invention will be described with reference to FIG. 1. FIG. 1 is a schematic plan view of an automatic winder system including a carrier distributing device according to one standpoint of the present invention.

[0035] The automatic winder system 101 includes an automatic winder 102, a bobbin processing device 103, and a bobbin supplying device 104. The automatic winder 102 is arranged on a left side of the bobbin processing device 103 in Fig. 1. The bobbin processing device 103

is arranged between the bobbin supplying device 104 and the automatic winder 102.

[0036] The automatic winder 102 includes a plurality of winding units 105. The winding unit 105 is a device that rewinds a spun yarn wound around a threaded bobbin tube 5B (described later) onto a different bobbin to manufacture a product package of the spun yarn.

[0037] The bobbin processing device 103 is a device that extracts an empty bobbin tube 5A (described later) discharged by the automatic winder 102 from a carrier 3, attaches the threaded bobbin tube 5B around which a yarn, spun with a spinning machine (not illustrated) configured by winding a spun yarn generated in the spinning machine (not illustrated) around a periphery of a tubular body, is wound to the carrier 3, and supplies the threaded bobbin tube 5B toward the automatic winder 102.

[0038] The bobbin supplying device 104 is a device that supplies the threaded bobbin tube 5B to the bobbin processing device 103.

(2) Carrier and bobbin

[0039] The carrier 3 and the bobbin tube 5 will be described with reference to FIGS. 2 and 3. FIG. 2 is a perspective view of a carrier. FIG. 3 is a perspective view of a carrier attached with a bobbin.

[0040] The carrier 3 is a transportation body used for the transportation of the bobbin tube 5. As shown in FIG. 2, the carrier 3 includes a disc-shaped base portion 3a and an attachment portion 3b serving as a circular column-shaped bobbin inserting portion projecting upward from the center of the upper surface of the base portion. The carrier 3 includes an intermediate circular column portion 3c serving as a bobbin mounting portion between the base portion 3a and the attachment portion 3b. The intermediate circular column portion 3c has a seating surface 67, on which the bobbin tube 5 is seated, and an outer peripheral surface 69. The carrier 3 transports the bobbin tube 5 in an orientation state the bobbin tube 5 is inserted to the attachment portion 3b.

[0041] The bobbin tube 5 is a cylindrical member, on the outer peripheral surface of which the yarn is wound. The bobbin tube 5 is slightly tapered.

[0042] When a bottom portion of the bobbin tube 5 is inserted to the attachment portion 3b of the carrier 3, the bobbin tube 5 is set in the carrier 3, as shown in FIG. 3, to be transported with the carrier 3. In the following description, a bobbin tube itself around which the spun yarn is not wound is referred to as an empty bobbin tube 5A, and a combination of the bobbin tube and the spun yarn wound thereon is referred to as the threaded bobbin tube 5.

(3) Automatic winder

[0043] As shown in FIG. 1, the automatic winder 102 includes a supply path 106 for transporting the threaded bobbin tube 5B to each winding unit 105. The automatic

winder 102 also includes a collecting path 107 for transporting the empty bobbin tube 5A discharged from each winding unit 105. The supply path 106 and the collecting path 107 are configured by a belt conveyor, and to transport the bobbin tube 5 using the carrier 3.

(4) Bobbin processing device

[0044] The bobbin processing device 103 includes, as a transportation means of the solid bobbin and the empty bobbin, a carrier transportation line 108 that transports such bobbins while being mounted on the carrier 3. The carrier transportation line 108 is connected to the supply path 106 and the collecting path 107 of the automatic winder 102. The carrier 3 attached with the threaded bobbin tube 5B is supplied to the winding unit 105 by the carrier transportation line 108 and the supply path 106 from the bobbin processing device 103. The carrier 3 attached with the empty bobbin tube 5A is returned to the bobbin processing device 103 by the collecting path 107 and the carrier transportation line 108 from the winding unit 105.

[0045] The carrier transportation line 108 includes a main transportation line 121, and a return transportation line 122.

[0046] The main transportation line 121 is a line for transporting the empty bobbin tube 5A discharged from the automatic winder 102, replacing the empty bobbin tube 5A with the threaded bobbin tube 5B in the middle of transportation, and transporting the threaded bobbin tube toward the automatic winder 102. The main transportation line 121 is formed into a substantially U-shape. A starting end of the main transportation line 121 is connected to a terminating end of the collecting path 107, and a terminating end of the main transportation line 121 is connected to a starting end of the supply path 106.

[0047] A structure of the carrier transportation line 108 will be described with reference to FIG. 4. FIG. 4 is a schematic cross-sectional view of the carrier and the carrier distributing device.

[0048] The carrier transportation line 108 includes a guiding path 21, and a belt conveyor 23 (includes first belt conveyor 23A and second belt conveyor 23B described later) arranged below the guiding path 21. The carrier 3 is transported on the belt conveyor 23 according to the guiding path 21. The following description is similar also for the supply path 106 and the collecting path 107.

[0049] The guiding path 21 is configured by an upper plate 25 formed with a slit. The belt conveyor 23 is arranged below the slit. The belt conveyor 23 is, for example, a flat belt or a round belt which is an endless belt.

[0050] The carrier 3 is transported while being mounted on the belt conveyor 23. When the carrier 3 is mounted on the belt conveyor 23, an orientation state in which the attachment portion 3b and the intermediate circular column portion 3c of the carrier 3 project out from the guiding path 21 is obtained. An outer peripheral surface 69 of the intermediate circular column portion 3c is then guided by

the guiding path 21, that is, a peripheral edge of the slit, so that the carrier 3 is transported along the guiding path 21.

[0051] Positioning to each device of the bobbin tube 5 and the carrier 3 is carried out by a stopper (not illustrated). Therefore, the drive of the belt conveyor 23 of the carrier transportation line 108 is basically not stopped.

[0052] A bobbin extracting device 11 and a solid bobbin supplying device 13 (bobbin attaching device) are arranged along the main transportation line 121.

[0053] The bobbin extracting device 11 is a device that extracts and collects the empty bobbin tube 5A from the carrier 3.

[0054] The solid bobbin supplying device 13 is a device that attaches the threaded bobbin tube 5B manufactured with the spinning machine to the carrier 3 in a substantially upright state. The threaded bobbin tube 5B is supplied from the bobbin supplying device 104 to the solid bobbin supplying device 13.

[0055] Although not illustrated, the solid bobbin supplying device 13 includes a bobbin inserting device, a part feeder, a bobbin distributing device, and a pair of bobbin chutes (120, 121). The solid bobbin supplying device 13 can simultaneously supply the empty bobbin tube 5A to the carrier 3 at two places with the bobbin distributing device and the pair of bobbin chutes. Each bobbin chute sets the bobbin tube 5 so as to be inserted to the attachment portion 3b of the carrier 3. The bobbin chute includes, for example, each divided piece obtained by dividing a cone-shaped cylindrical body in two in an axial direction.

[0056] In the main transportation line 121, a bunch unwinding device 15, a yarn end processing device 17, and a pick finding device 19 are arranged downstream in the transporting direction of the solid bobbin supplying device 13.

[0057] The bunch unwinding device 15 is a device that unwinds a bunch winding of a bottom bunch wound around the threaded bobbin tube 5B.

[0058] The yarn end processing device 17 is a device that cuts a back wind yarn wound around a yarn layer surface of the threaded bobbin tube 5B, and removes a remaining yarn side of the back wind yarn.

[0059] The pick finding device 19 is a device that separates and finds pick of the yarn end from the surface of the threaded bobbin tube 5B, and winds the found pick of yarn end at a top of the bobbin main body to insert the yarn end to a top hole of the bobbin main body.

[0060] The return transportation line 122 is a path for reprocessing the threaded bobbin tube 5B that, for example, failed in the pick finding process. The return transportation line 122 is a bypass path that connects a terminating end and a starting end of the main transportation line 121.

[0061] In the present embodiment, a set of bunch unwinding device 15, yarn end processing device 17, and pick finding device 19 is also arranged in the return transportation line 122. The description thereof will be omitted.

(5) Flow of carrier

[0062] The flow of the carrier 3 will be described below.

[0063] When the empty carrier 3 reaches a position immediately below the bobbin chute (not illustrated) of the solid bobbin supplying device 13, the threaded bobbin tube 5B is mounted on the empty carrier 3 in a substantially upright state.

[0064] Next, the carrier 3 is transported on the main transportation line 121 toward the downstream bunch unwinding device 15. In the bunch unwinding device 15, the bottom bunch formed in the threaded bobbin tube 5B is removed.

[0065] Next, the threaded bobbin tube 5B is transported on the main transportation line 121 toward the yarn end processing device 17. In the yarn end processing device 17, the back wind yarn wound around the yarn layer surface of the threaded bobbin tube 5B is cut, and a distal end side winding portion is formed.

[0066] Next, the threaded bobbin tube 5B is transported on the main transportation line 121 toward the pick finding device 19. In the pick finding device 19, the distal end side winding portion is sucked upward, and inserted to the inner side of the tubular body of the threaded bobbin tube 5B.

[0067] Then, the threaded bobbin tube 5B is further transported downstream on the main transportation line 121, and supplied to the supply path 106 of the automatic winder 102. The threaded bobbin tube 5B is transported on the supply path 106, and supplied to either winding unit 105.

[0068] In the winding unit 105, the unwinding of the yarn is carried out from the threaded bobbin tube 5B, and the unwound yarn is wound into a package.

[0069] The carrier 3 mounted with the empty bobbin tube 5A, in which the peripheral yarn are all unwound, is discharged from the winding unit 105, and again returned to the main transportation line 121 of the bobbin processing device 103 through the collecting path 107.

[0070] In the main transportation line 121, the bobbin extracting device 11 extracts the empty bobbin tube 5A mounted on the carrier 3.

(6) Carrier distributing device

[0071] The carrier distributing device 31 will be described with reference to FIGS. 1, 5, and 6. FIGS. 5 and 6 are partial plan views showing a periphery of the branched portion.

[0072] The carrier distributing device 31 is a part of the bobbin processing device 103 described above. The carrier distributing device 31 is a device that distributes the carrier 3 with respect to the solid bobbin supplying device 13 including a pair of bobbin chutes 120, 121 (one example of bobbin attaching unit).

[0073] The carrier distributing device 31 includes a carrier transportation path 33 as a part of the main transportation line 121.

[0074] As shown in FIGS. 1, 5, and 6, the carrier transportation path 33 includes a carrier introducing portion 36, a branched portion 37 continuing to the carrier introducing portion 36, a first transportation path 38 and a second transportation path 39 branched from the branched portion 37 and extended in parallel toward the pair of bobbin chutes (not illustrated), and a merging portion 51 where the first transportation path 38 and the second transportation path 39 merge.

[0075] The first transportation path 38 is a path linearly extending from the branched portion 37 to the merging portion 51. In the first transportation path 38, the carrier 3 is mainly driven by a first belt conveyor 23A (one example of first driving unit). The first belt conveyor 23A includes a linearly arranged flat belt. The first belt conveyor 23A is configured by the flat belt, a drive pulley and a driven pulley (not illustrated) wound around the flat belt, and a first drive motor 71 (FIG. 18) that drives the drive pulley.

[0076] The second transportation path 39 is a path extending on the outer side (bobbin supplying device 104 side) of the first transportation path 38 from the branched portion 37 to the merging portion 51. In the second transportation path 39, the carrier 3 is driven by the second belt conveyor 23B (one example of second driving unit). The second belt conveyor 23B is a driving means that transports the carrier 3 in the majority of the main transportation line 121 and the return transportation line 122. The second belt conveyor 23B is configured by a round belt, a drive pulley and a plurality of driven pulleys (not illustrated) wound around the round belt, and a second drive motor 73 (FIG. 18) that drives the drive pulley.

[0077] As shown in FIGS. 1 and 20 to 22, a carrier sensor 55 is provided in the vicinity of the merging portion 51. The carrier sensor 55 is a proximity sensor (described later) that detects a state of the carrier at the merging portion 51.

[0078] The carrier distributing device 31 further includes a first cutout device 59 and a second cutout device 61. The first cutout device 59 and the second cutout device 61 are arranged on the first transportation path 38 and the second transportation path 39, respectively, and switch the carrier 3 attached with the threaded bobbin tube 5B by the bobbin chute from the stopped state to the released state to cut out the carrier 3 one at a time at an appropriate interval.

[0079] The carrier distributing device 31 includes a distributing member 41. The distributing member 41 is a member arranged on the branched portion 37 to distribute the carrier 3 to the first transportation path 38 and the second transportation path 39.

[0080] The distributing member 41 can change the orientation between a first orientation A (FIG. 5) of guiding the carrier 3 to the first transportation path 38, and a second orientation B (FIG. 6) of guiding the carrier to the second transportation path 39. After guiding the carrier 3 to the first transportation path 38, the distributing member 41 is changed from the first orientation A to the second

orientation B by the relevant carrier 3. Moreover, after guiding the carrier 3 to the second transportation path 39, the distributing member 41 is changed from the second orientation B to the first orientation A by the relevant carrier 3.

[0081] In the carrier distributing device 31, the carrier 3 is moved from the carrier introducing portion 36 to the branched portion 37, and then alternately, that is, evenly distributed to the first transportation path 38 and the second transportation path 39 by the distributing member 41. The reason for alternately distributing the carrier is because the distributing member 41 is changed from the first orientation A to the second orientation B after distributing the carrier 3 to the first transportation path 38, and is changed from the second orientation B to the first orientation A after distributing the carrier 3 to the second transportation path 39.

[0082] Furthermore, the orientation of the distributing member 41 is changed by the transported carrier 3. Therefore, a member (e.g., spring, solenoid) for driving the distributing member 41 is not necessary. That is, the distributing operation is realized with a simple structure.

(7) Details of distributing member

[0083] The distributing member 41 will be described in detail with reference to FIG. 7. FIG. 7 is a partial plan view showing the carrier distributing device. In FIG. 7, a solid line indicates the first orientation A and a dashed line indicates the second orientation B with respect to the distributing member 41.

[0084] The distributing member 41 is a plate-shaped piece. Therefore, a space occupied by the distributing member 41 is small.

[0085] As shown in FIG. 4, a portion that comes into contact with the distributing member 41 in the carrier 3 is the outer peripheral surface 69 of the intermediate circular column portion 3c. Therefore, the general carrier 3 can be used as it is.

[0086] As shown in FIG. 7, the distributing member 41 includes a main body portion 43, a contact guiding portion 45, a first swing contacting portion 47, and a second swing contacting portion 49.

[0087] The main body portion 43 is swingable. Specifically, the main body portion 43 is swingably supported at a corner of the upper plate 25 sectionalizing the first transportation path 38 and the second transportation path 39 by way of a pin structure 79.

[0088] As shown in FIG. 7, a limiting mechanism 63 that limits a swing angle of the distributing member 41 is arranged at the corner of the upper plate 25. The limiting mechanism 63 includes an arc-shaped slit 81 formed in the upper plate 25, and a pin 83 extending from the distributing member 41 and moving within the slit. Therefore, the orientation of the distributing member 41 becomes accurate as the swing angle of the distributing member 41 is limited.

[0089] The contact guiding portion 45 is arranged in

the main body portion 43, and makes contact with the carrier 3 when the carrier 3 approaches the distributing member 41 from the carrier introducing portion 36, and thereafter, guides the carrier 3. Specifically, the contact guiding portion 45 has a substantially triangular shape in plan view, and includes a distal end portion 45a, a first receiving side 45b on the first transportation path 38 side, and a second receiving side 45c on the second transportation path 39 side. Therefore, the shape of the distributing member 41 is simple. When the distributing member 41 is in the first orientation A, the first receiving side 45b faces the carrier introducing portion 36 side, as shown in FIG. 8. When the distributing member 41 is in the second orientation B, the second receiving side 45c faces the carrier introducing portion 36 side, as shown in FIG. 12.

[0090] The first swing contacting portion 47 is formed on the first transportation path 38 side with respect to the contact guiding portion 45 in the main body portion 43. When the distributing member 41 is in the first orientation A, the first swing contacting portion 47 is projected out to the first transportation path 38, as shown in FIG. 8. The second swing contacting portion 49 is formed on the second transportation path 39 side with respect to the contact guiding portion 45 in the main body portion 43. When the distributing member 41 is in the second orientation B, the second swing contacting portion 49 is projected out to the second transportation path 39, as shown in FIG. 12.

[0091] Therefore, when the carrier 3 makes contact with the first swing contacting portion 47 as the carrier 3 is moved on the first transportation path 38 in the first orientation A, the distributing member 41 is swung to change from the first orientation A to the second orientation B. Furthermore, when the carrier 3 makes contact with the second swing contacting portion 49 as the carrier 3 is moved on the second transportation path 39 in the second orientation B, the distributing member 41 is swung to change from the second orientation B to the first orientation A.

[0092] In this device, the distributing member 41 can distribute the carriers 3 evenly to the first transportation path 38 and the second transportation path 39 by simply swinging between the first orientation A and the second orientation B.

(8) Details of distributing operation

[0093] The operation in which the carrier 3 is distributed to the first transportation path 38 will be described with reference to FIGS. 8 to 11. FIGS. 8 to 11 are partial plan views showing the carrier distributing operation.

[0094] When the carrier 3 approaches the branched portion 37, as shown in FIG. 8, the carrier 3 makes contact with the distributing member 41, as shown in FIG. 9. Specifically, the intermediate circular column portion 3c of the carrier 3 makes contact with the distal end portion 45a of the contact guiding portion 45 of the distributing

member 41. As a result, as shown in FIG. 10, the carrier 3 is guided by the first receiving side 45b of the contact guiding portion 45 to be moved toward the first transportation path 38. Thereafter, the carrier 3 is moved on the first transportation path 38 by the first belt conveyor 23A. Then, as shown in FIG. 11, the carrier 3 makes contact with the first swing contacting portion 47, thus swinging the distributing member 41 from the first orientation A to the second orientation B.

[0095] The operation in which the carrier 3 is distributed to the second transportation path 39 will be described with reference to FIGS. 12 to 15. FIGS. 12 to 15 are partial plan views showing the carrier distributing operation.

[0096] When the carrier 3 approaches the branched portion 37, as shown in FIG. 12, the carrier 3 makes contact with the distributing member 41, as shown in FIG. 13. Specifically, the intermediate circular column portion 3c of the carrier 3 makes contact with the distal end portion 45a of the contact guiding portion 45 of the distributing member 41. As a result, as shown in FIG. 14, the carrier 3 is guided by the second receiving side 45c of the contact guiding portion 45 to be moved toward the second transportation path 39. Thereafter, the carrier 3 is moved on the second transportation path 39 by the second belt conveyor 23B. Then, as shown in FIG. 15, the carrier 3 makes contact with the second swing contacting portion 49, thus swinging the distributing member 41 from the second orientation B to the first orientation A.

[0097] The carrier 3 sometimes stops near the branched portion 37 when the carriers 3 are stagnated in the first transportation path 38. In such a case, the carrier 3 that approaches the branched portion 37 next makes contact with the stopped carrier 3 to be guided to the second transportation path 39. That is, the transportation guide (guiding path 21) is formed by the layout of the guiding path 21 so that the operations described above are executed. This is the same regardless of whether the distributing member 41 is in the first orientation A, as shown in FIG. 16, or the distributing member 41 is in the second orientation B, as shown in FIG. 17.

[0098] As described above, the carrier 3 is guided to the second transportation path 39 when the carriers 3 are full and stagnated in the first transportation path 38. Therefore, the transportation efficiency of the carrier 3 at the branched portion 37 is less likely to lower.

(9) Control configuration of carrier distributing device

[0099] The control configuration of the carrier distributing device 31 will be described with reference to FIG. 18. FIG. 18 is a block diagram showing the control configuration of the carrier distributing device.

[0100] The carrier distributing device 31 includes a controller 57. The controller 57 is a computer system including a processor (e.g., CPU), a storage device (e.g., ROM, RAM, HDD, SSD, and the like), and various types of interfaces (e.g., A/D converter, D/A converter, com-

munication interface, and the like). The control section carries out various control operations by executing a program stored in the storage unit (corresponds to some or all of a storage region of storage device).

[0101] The controller 57 may be configured with a single processor, but may be configured with a plurality of processors, each being independent for each control.

[0102] Some or all of the function of each element of the controller 57 may be realized as a program executable in the computer system configuring the control section. In addition, some of the function of each element of the controller 57 may be configured by a custom IC.

[0103] The controller 57 is connected to the solid bobbin supplying device 13, the first drive motor 71, the second drive motor 73, the first cutout device 59, and the second cutout device 61. Therefore, the controller 57 can transmit control signals to such devices.

[0104] The first drive motor 71 drives the first belt conveyor 23A, that is, the first transportation path 38. The second drive motor 73 drives the second belt conveyor 23B, that is, the second transportation path 39.

[0105] The controller 57 is connected to the carrier sensor 55. Therefore, the controller 57 can accurately determine whether a bridge of the carrier 3 has occurred at the merging portion 51. The carrier sensor 55 checks the passing of the carrier 3 at a point ahead of the merging portion 51.

[0106] Although not illustrated, the controller 57 is also connected to a sensor that detects the size, shape, and position of the carrier and the bobbin, a sensor and a switch that detect the state of each device, and an information input device.

(10) Bridge resolving control of merging portion

[0107] The bridge resolving control of the merging portion of the carrier distributing device will be described with reference to FIGS. 19 to 22. FIG. 19 is a flowchart showing the bridge resolving control of the merging portion of the carrier distributing device. FIGS. 20 to 22 are partial plan views showing the bridge resolving operation at the merging portion.

[0108] The control flowchart described below is illustrative, and each step may be omitted or interchanged as necessary. Furthermore, a plurality of steps may be executed simultaneously, or some or all of the steps may be executed in an overlapping manner.

[0109] Furthermore, each block of the control flowchart is not limited to a single control operation, and may be replaced with a plurality of control operations represented with a plurality of blocks.

[0110] In general, as shown in FIG. 20, the carrier 3 attached with the threaded bobbin tube 5B moves on the first transportation path 38 and the second transportation path 39, and passes through the merging portion 51 to move further downstream.

[0111] In step S1 of FIG. 19, the controller 57 determines whether or not the bridge of the carrier 3 has oc-

curred at the merging portion 51 according to the detection signal from the carrier sensor 55.

[0112] FIG. 21 shows a state in which the bridge has occurred at the merging portion 51. That is, the carrier 3 does not move further from the merging portion 51, and a state in which the carrier 3 is not detected by the carrier sensor 55 continues. Thus, if the carrier 3 cannot be detected even after elapse of a predetermined time from the execution of the cutout of the carrier 3, the controller 57 determines that the bridge has occurred.

[0113] In step S2, the controller 57 determines whether or not the chute operation is under operating in the solid bobbin supplying device 13. If in the shoot operation is under operating, the termination of the chute operation is waited.

[0114] In step S3, the controller 57 stops the cutout operation of the first cutout device 59 and the second cutout device 61.

[0115] In step S4, the controller 57 reversely rotates the first belt conveyor 23A by reversely rotating the first drive motor 71. Thus, as shown in FIG. 22, the carrier 3 on the first transportation path 38 is moved backward.

[0116] In step S5, the controller 57 stops the first belt conveyor 23A by stopping the first drive motor 71. As a result, the carrier 3 on the first transportation path 38 stops while being away from the merging portion 51. That is, the bridge at the merging portion 51 is resolved, and hence the carrier 3 on the second transportation path 39 is moved farther through the merging portion 51.

[0117] In step S6, the controller 57 thereafter determines whether or not the bridge of the carrier 3 is resolved at the merging portion 51 according to the detection signal from the carrier sensor 55.

[0118] In step S7, the controller 57 waits until elapse of a predetermined time. Meanwhile, the discharging of the carrier 3 on the second transportation path 39 from the merging portion 51 is completed.

[0119] In step S8, the controller 57 normally rotates the first belt conveyor 23A by normally rotating the first drive motor 71. Thus, the carrier 3 on the first transportation path 38 moves forward, as shown in FIG. 22.

[0120] In step S9, the controller 57 waits until elapse of a predetermined time. Meanwhile, the discharging of the carrier 3 on the first transportation path 38 from the merging portion 51 is completed.

[0121] In step S10, the controller 57 starts the cutout operation of the first cutout device 59 and the second cutout device 61.

[0122] As described above, in the carrier distributing device 31, the carrier 3 is moved backward/stopped on the first transportation path 38 when the bridge of the carrier 3 occurs at the merging portion 51. Thus, the carrier 3 on the first transportation path 38 can be moved forward by resolving the bridge of the carrier 3 at the merging portion 51. As a result, the bridge of the carrier 3 at the merging portion 51 is quickly resolved with a simple operation.

[0123] Prior to the operation of resolving the bridge of

the carrier 3 at the merging portion 51 being carried out, the cutout operation of the first cutout device 59 and the second cutout device 61 is canceled. Therefore, a great number of carriers 3 do not move toward the merging portion 51, and consequently, the bridge of the carrier 3 at the merging portion 51 is reliably and quickly resolved.

2. Other embodiments

[0124] One embodiment of the present invention has been described above, but the present invention is not limited to the above-described embodiment, and various modifications can be made within a scope not deviating from the gist of the invention. In particular, a plurality of embodiments and alternative embodiments described in the present specification can be arbitrarily combined as necessary.

[0125] In particular, a specific shape of the distributing member is changed depending on the shape of the branched portion, and is not limited to the embodiment described above.

Claims

1. A carrier distributing device (31) configured to distribute a carrier (3) with respect to a bobbin attaching device (13) including two bobbin attaching units (120, 121), the carrier distributing device comprising:

a carrier transportation path (33) including a carrier introducing portion (36), a branched portion (37) continuing to the carrier introducing portion (36), a first transportation path (38) and a second transportation path (39) branched from the branched portion (37) and extended toward the two bobbin attaching units (120, 121), and a merging portion (51) where the first transportation path (38) and the second transportation path (39) merge; and

a distributing member (41) arranged at the branched portion (37) to distribute the carrier (3) to the first transportation path (38) and the second transportation path (39) by changing an orientation between a first orientation (A) of guiding the carrier (3) to the first transportation path (38) and a second orientation of guiding the carrier (3) to the second transportation path (39), wherein

the distributing member (41) is configured to be changed from the first orientation (A) to the second orientation (B) by the carrier (3) after guiding the carrier (3) to the first transportation path (38), and to be changed from the second orientation (B) to the first orientation (A) by the carrier (3) after guiding the carrier (3) to the second transportation path (39).

2. The carrier distributing device (31) according to claim 1, wherein the distributing member (41) includes

a main body portion (43) that is swingable, 5
 a contact guiding portion (45) arranged on the main body portion (43) to guide the carrier (3), when the carrier (3) is brought into contact with the distributing member (41) from the carrier introducing portion (36), 10
 a first swing contacting portion (47) formed on the first transportation path (38) side with respect to the contact guiding portion (45) in the main body portion (43), the distributing member (41) being swung to change from the first orientation (A) to the second orientation (B) when the carrier (3) is brought into contact with the first swing contacting portion while the carrier (3) is moving on the first transportation path (38) in the first orientation (A), and 15
 a second swing contacting portion (49) formed on the second transportation path (39) side with respect to the contact guiding portion (45) in the main body portion (43), the distributing member (41) being swung to change from the second orientation (B) to the first orientation (A) when the carrier (3) is brought into contact with the second swing contacting portion while the carrier (3) is moving on the second transportation path (39) in the second orientation (B). 20 25 30

3. The carrier distributing device (31) according to claim 1 or 2, wherein the carrier (3) is movable to the second transportation path (39) through the branched portion (37) regardless of whether the distributing member (41) is in the first orientation (A) or the second orientation (B), and 35
 a transportation guide (21) is formed so that when the carrier (3) is stagnated in the first transportation path (38) and the carrier (3) is stopped in the vicinity of the branched portion (37), a next carrier (3) is brought into contact with the stopped carrier (3) and guided to move to the second transportation path (39). 40 45

4. The carrier distributing device (31) according to any one of claims 1 to 3, further comprising:

a first driving unit (23A) configured to drive the first transportation path (38); 50
 a second driving unit (23B) configured to drive the second transportation path (39);
 a carrier sensor (55) configured to detect a state of the carrier (3) at the merging portion (51); and 55
 a controller (57) that is configured to

a) when determining that a bridge of the car-

rier (3) has occurred at the merging portion (51) according to a detection signal from the carrier sensor (55), control the first driving unit (23A) or the second driving unit (23B) to move backward/stop the first transportation path (38) or the second transportation path (39), and

b) when subsequently determining that the bridge of the carrier (3) is resolved at the merging portion (51) according to a detection signal from the carrier sensor (55), control the first driving unit (23A) or the second driving unit (23B) to move forward the first transportation path (38) or the second transportation path (39) .

5. The carrier distributing device (31) according to claim 4, further comprising:

a first cutout device (59) and a second cutout device arranged on the first transportation path (38) and the second transportation path (39), respectively, to continuously execute stopping and releasing of forward movement on the carrier; wherein the controller (57) is configured to

cancel a cutout operation of the first cutout device (59) and the second cutout device (61) before backward moving/stopping the first transportation path (38) or the second transportation path (39) when determining that the bridge of the carrier (3) has occurred at the merging portion (51) according to a detection signal from the carrier sensor (55), and start the cutout operation of the first cutout device (59) and the second cutout device (61) after forward moving the first transportation path (38) or the second transportation path (39).

6. The carrier distributing device (31) according to any one of claims 2 to 5, wherein the main body portion (43) is swingably supported at a corner of an upper plate (25) sectionalizing the first transportation path (38) and the second transportation path (39) by way of a pin structure (79), a limiting mechanism (63) configured to limit a swing angle of the distributing member (41) being arranged at the corner of the upper plate (25).

7. The carrier distributing device (31) according to claim 6, wherein the limiting mechanism (63) includes an arc-shaped slit (81) formed in the upper plate (25), and a pin (83) that extends from the distributing member (41) and moves in the slit (81).

FIG. 1

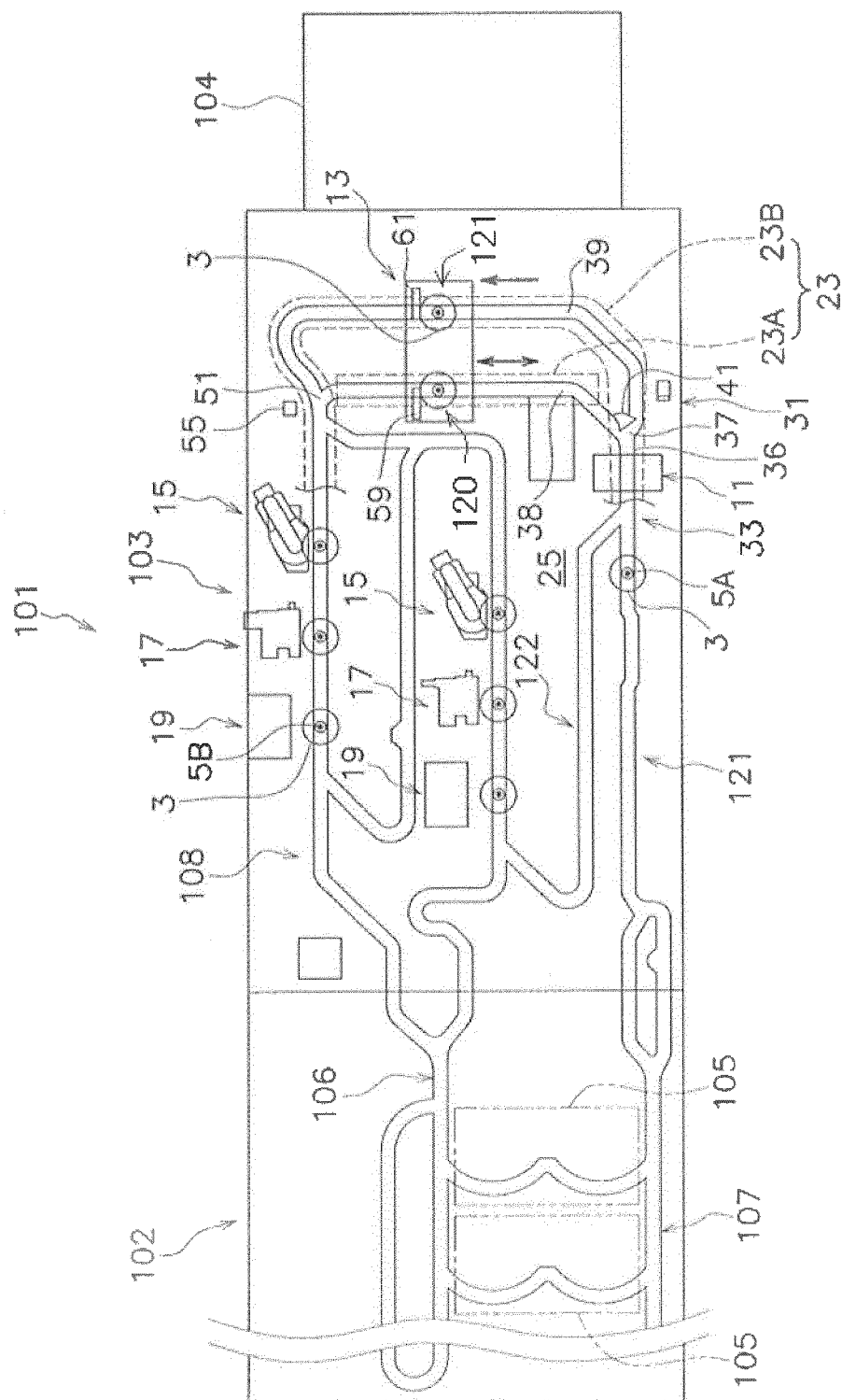


FIG. 2

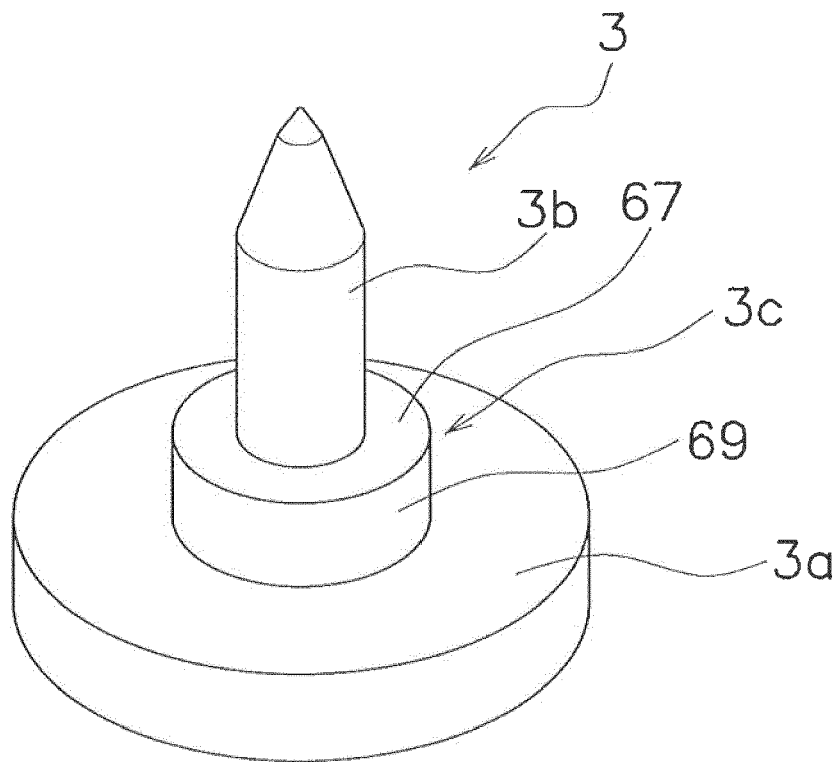


FIG. 3

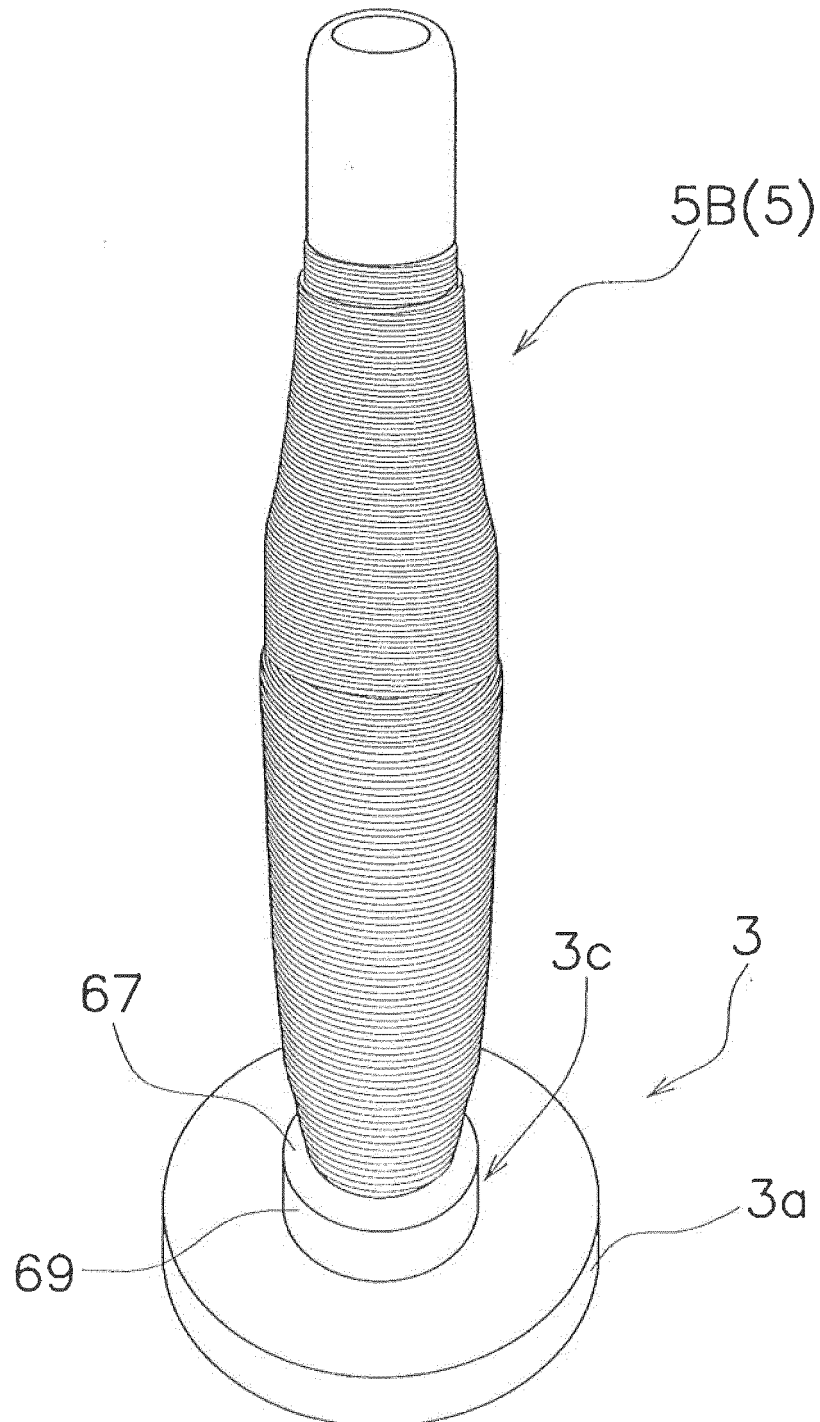


FIG. 4

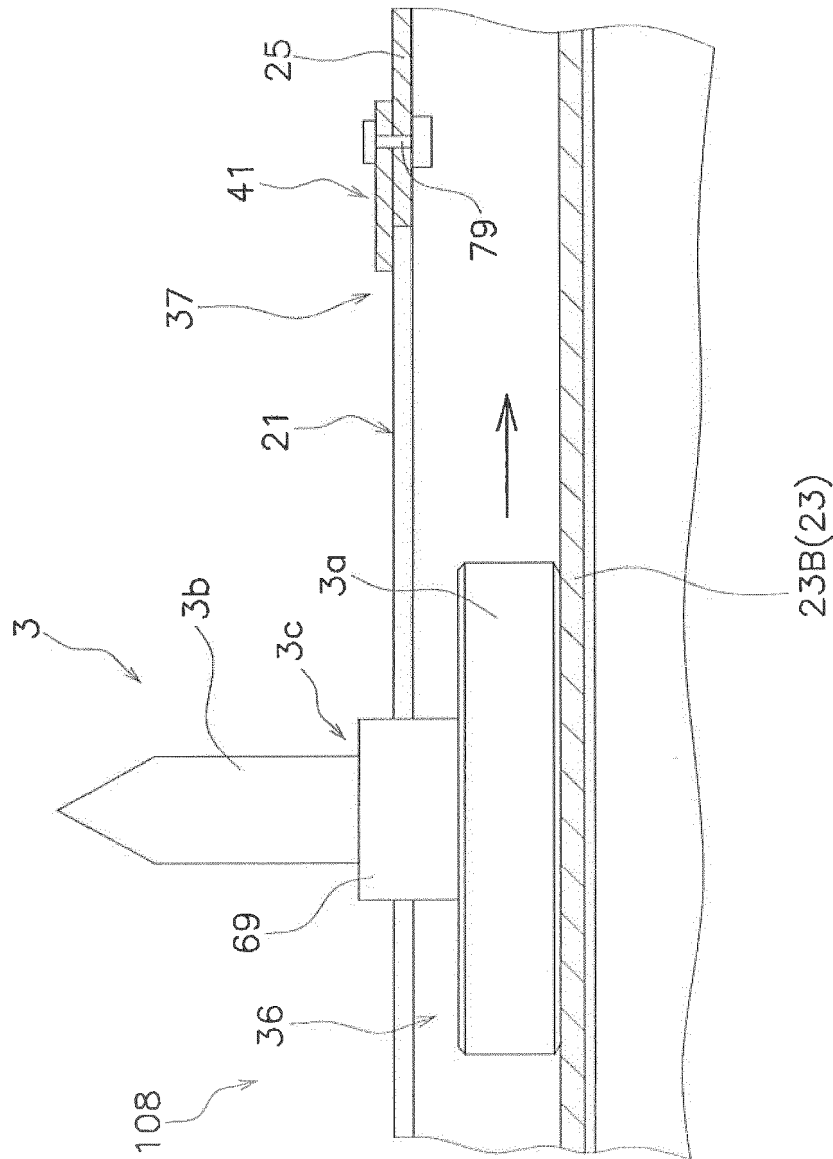


FIG. 5

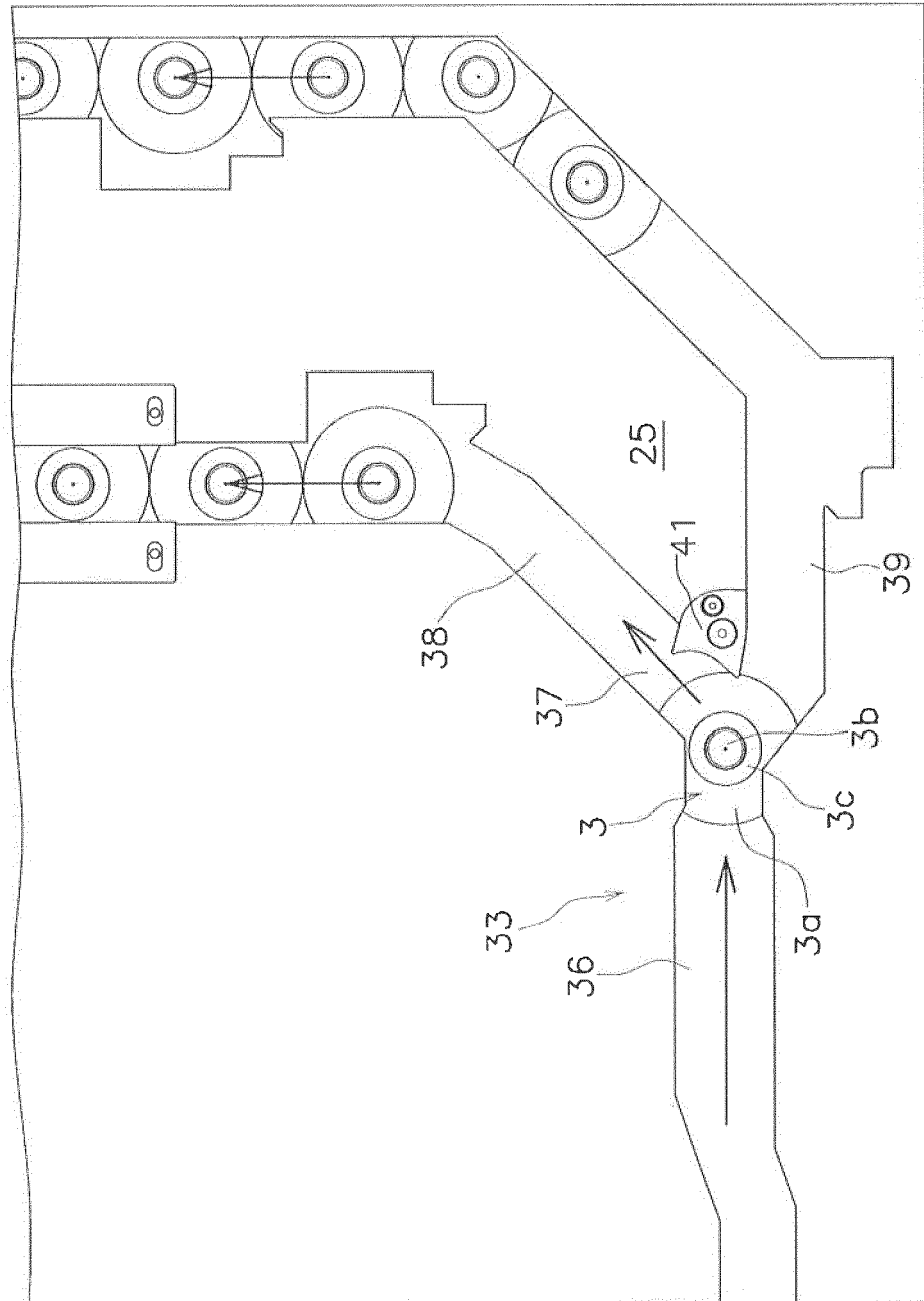


FIG. 6

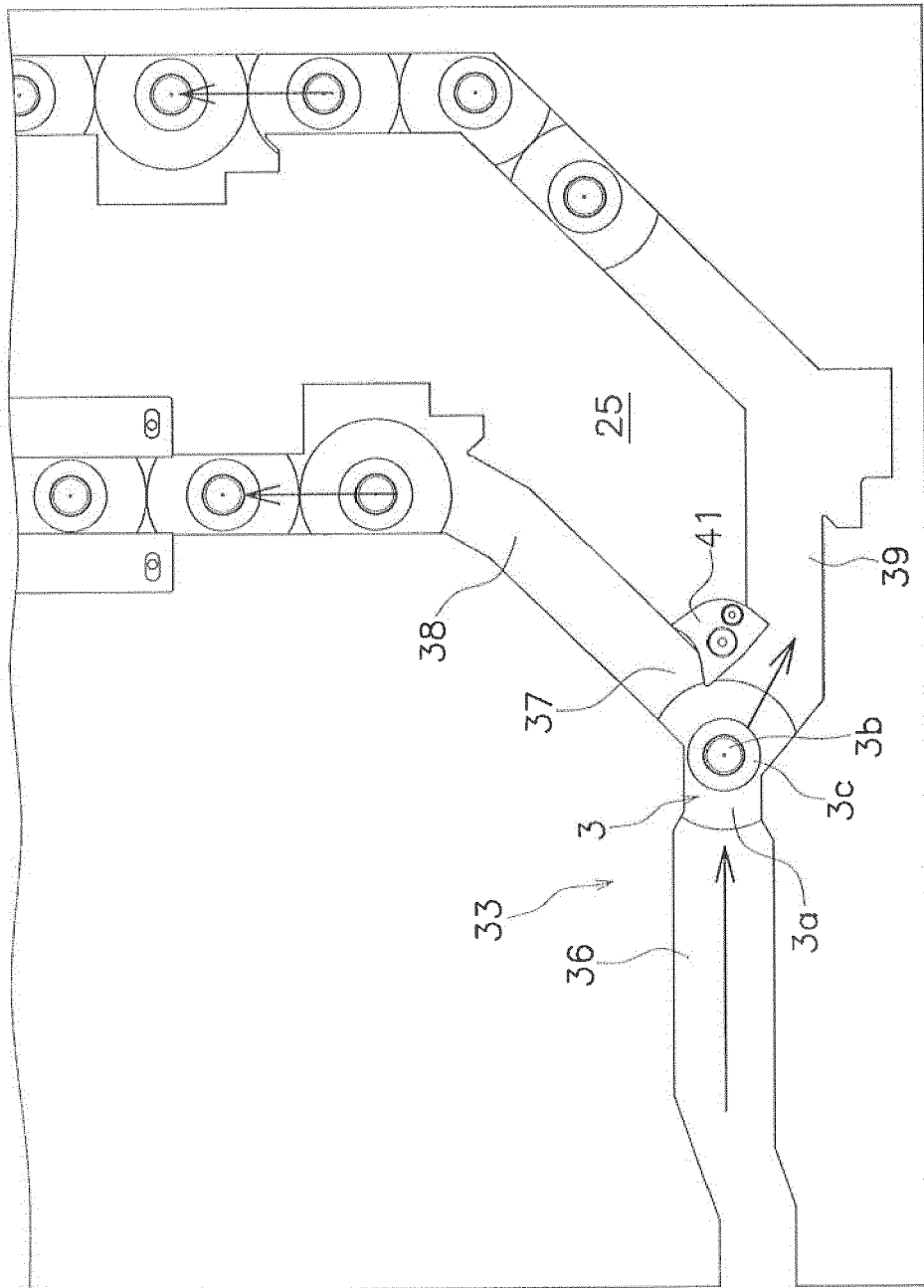


FIG. 7

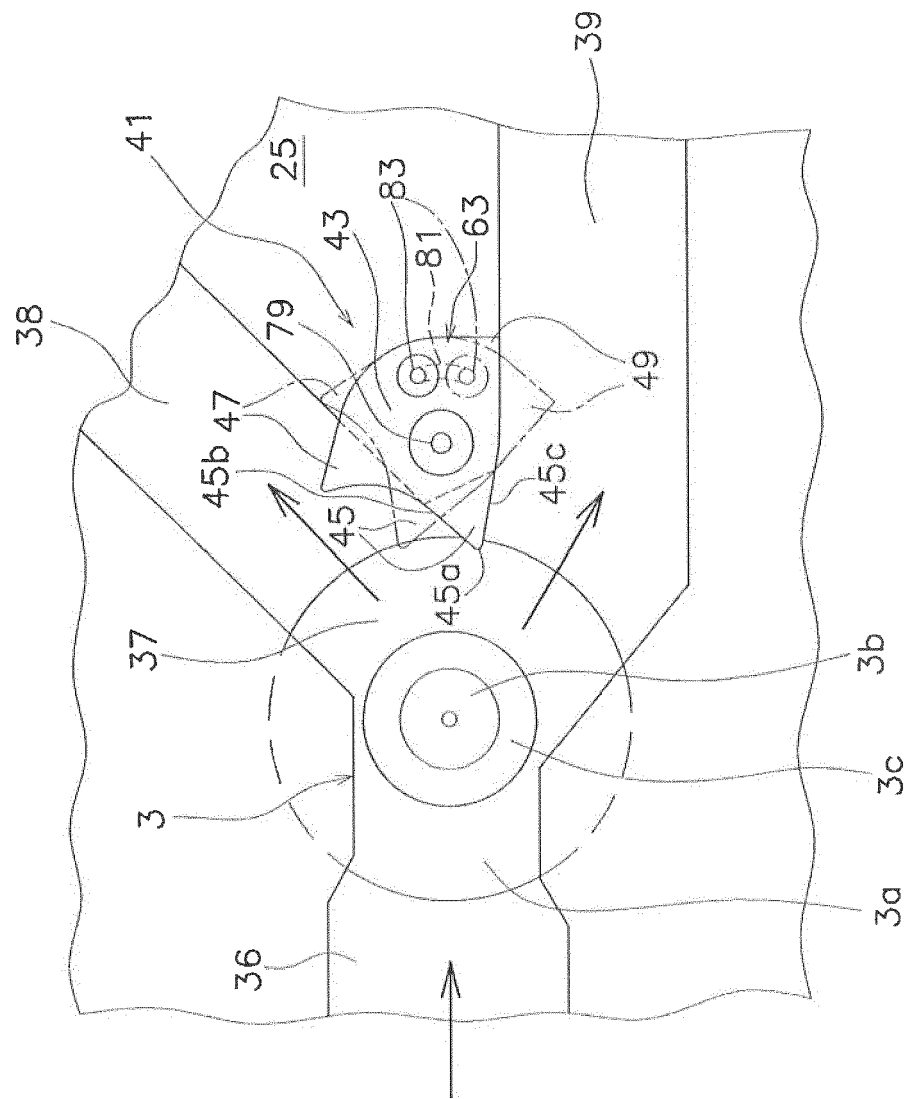


FIG. 8

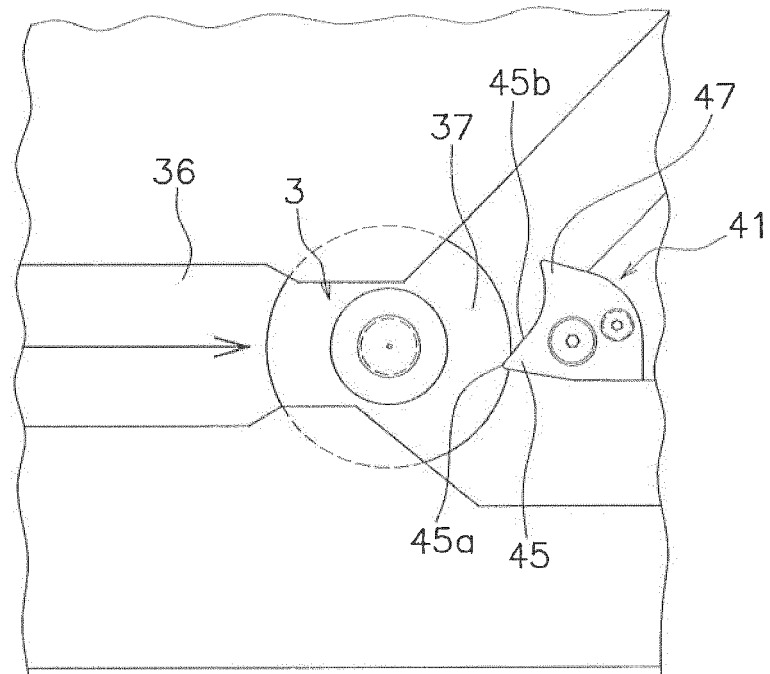


FIG. 9

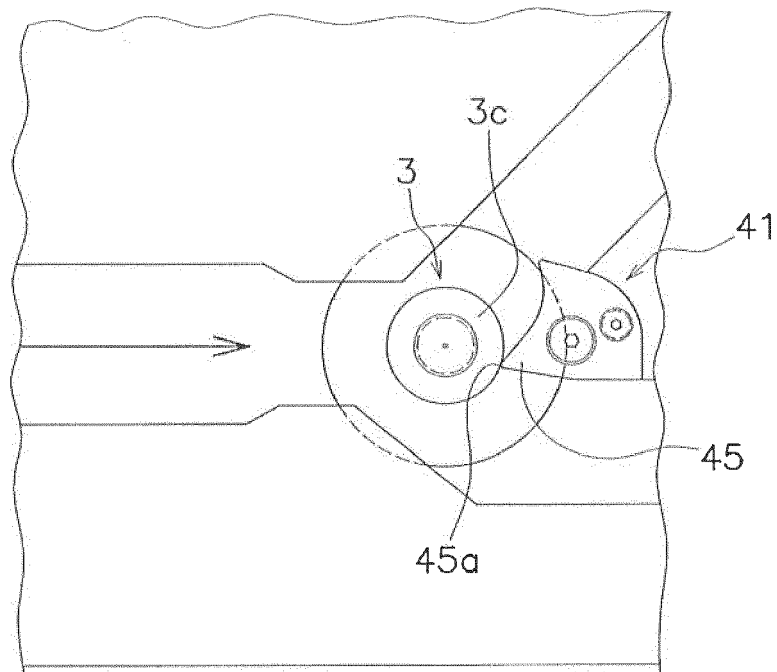


FIG. 10

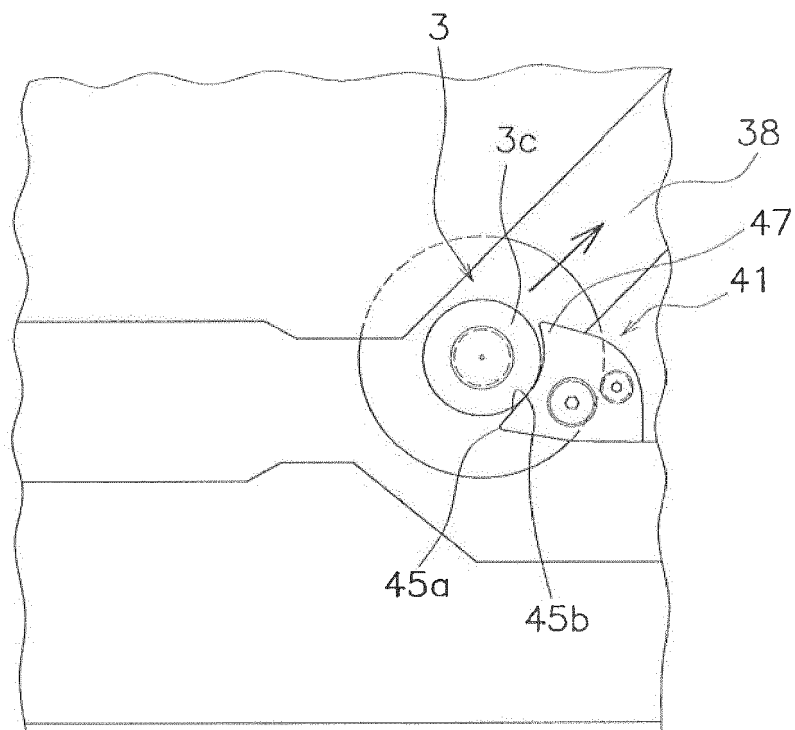


FIG. 11

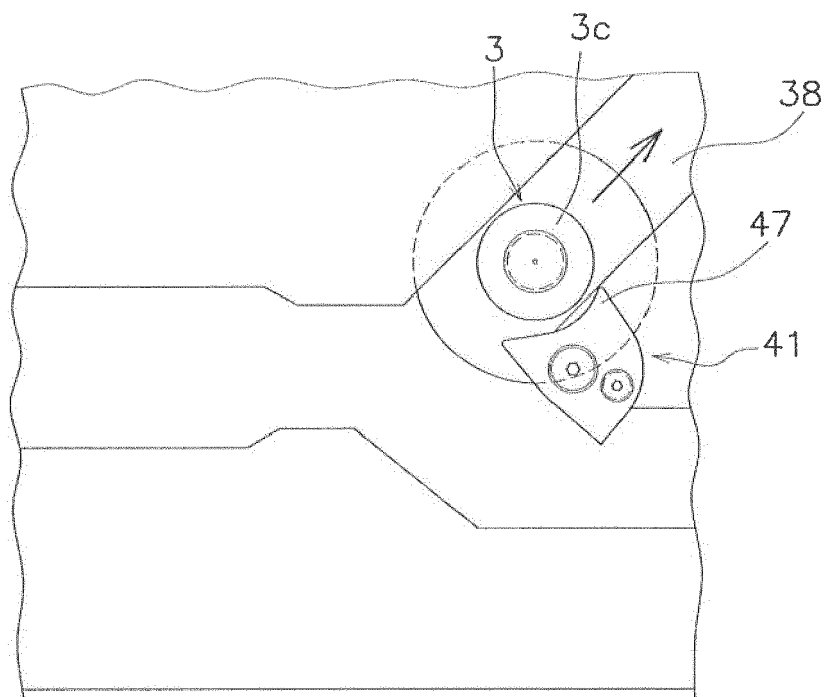


FIG. 12

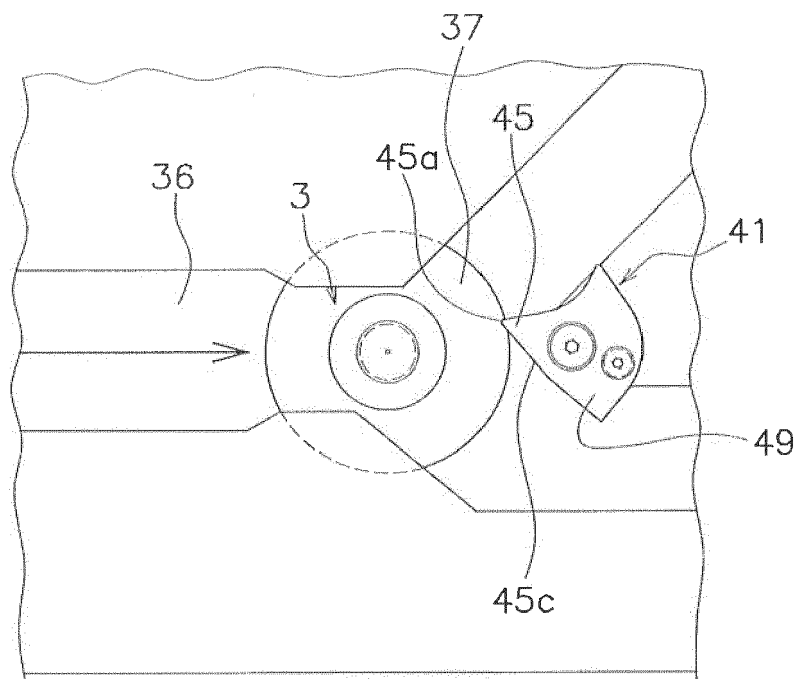


FIG. 13

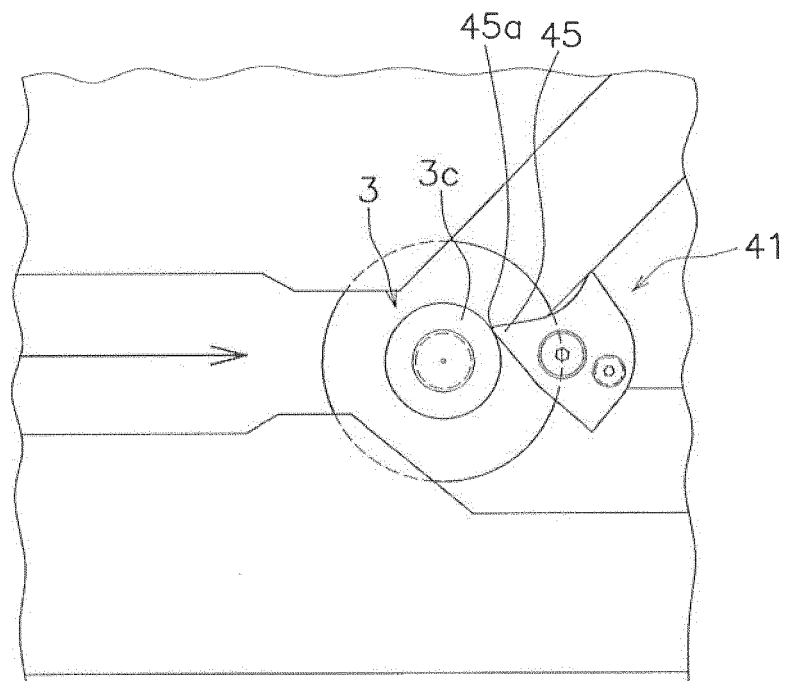


FIG. 14

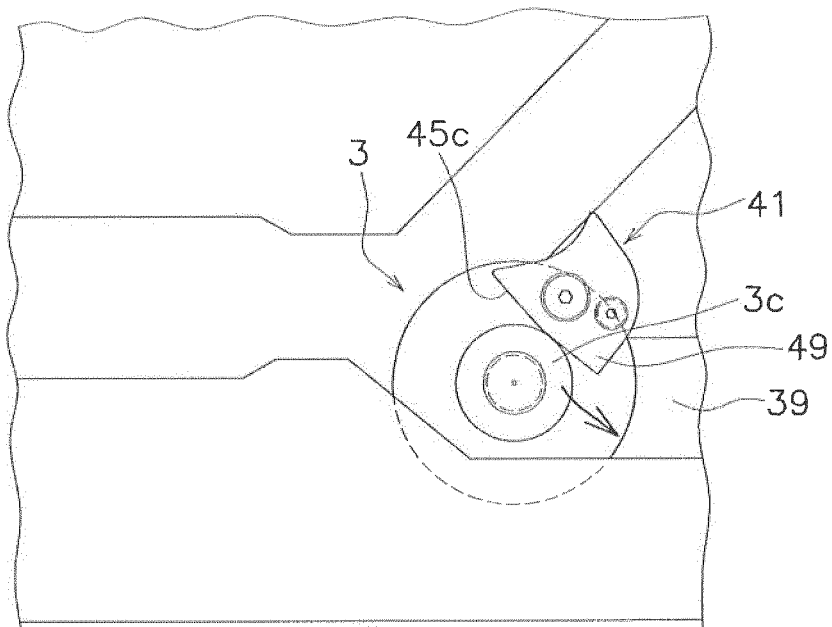


FIG. 15

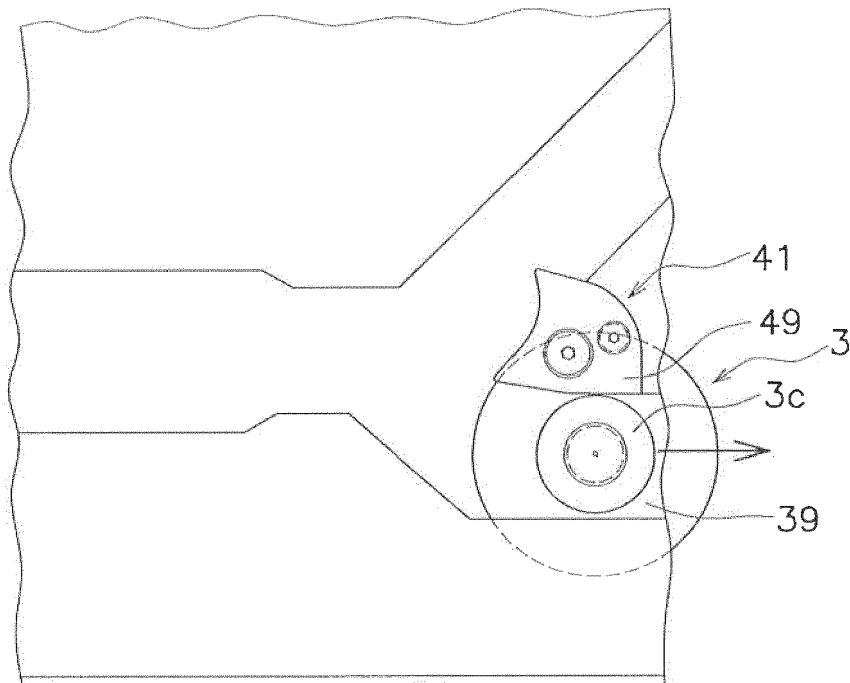


FIG. 16

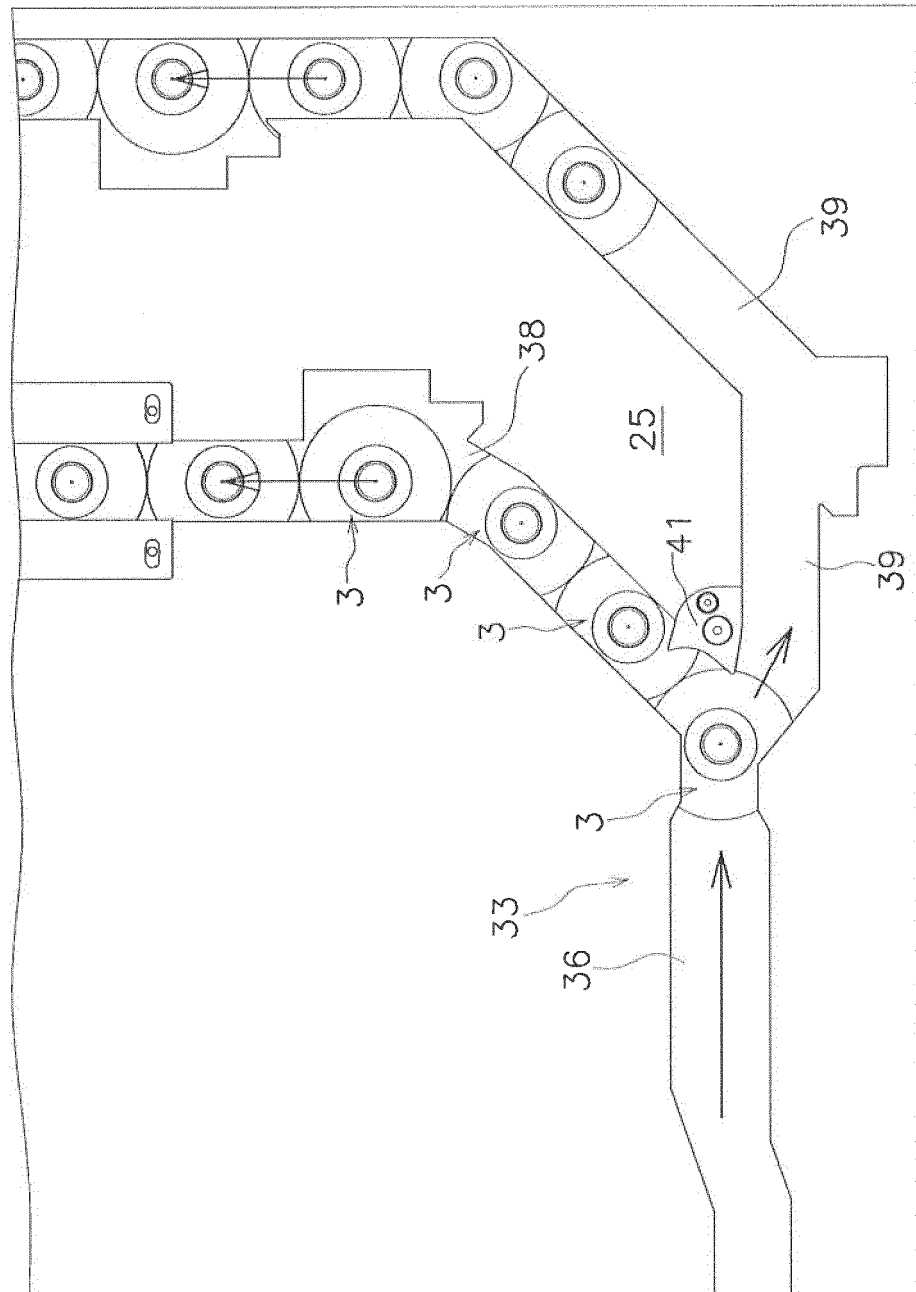


FIG. 17

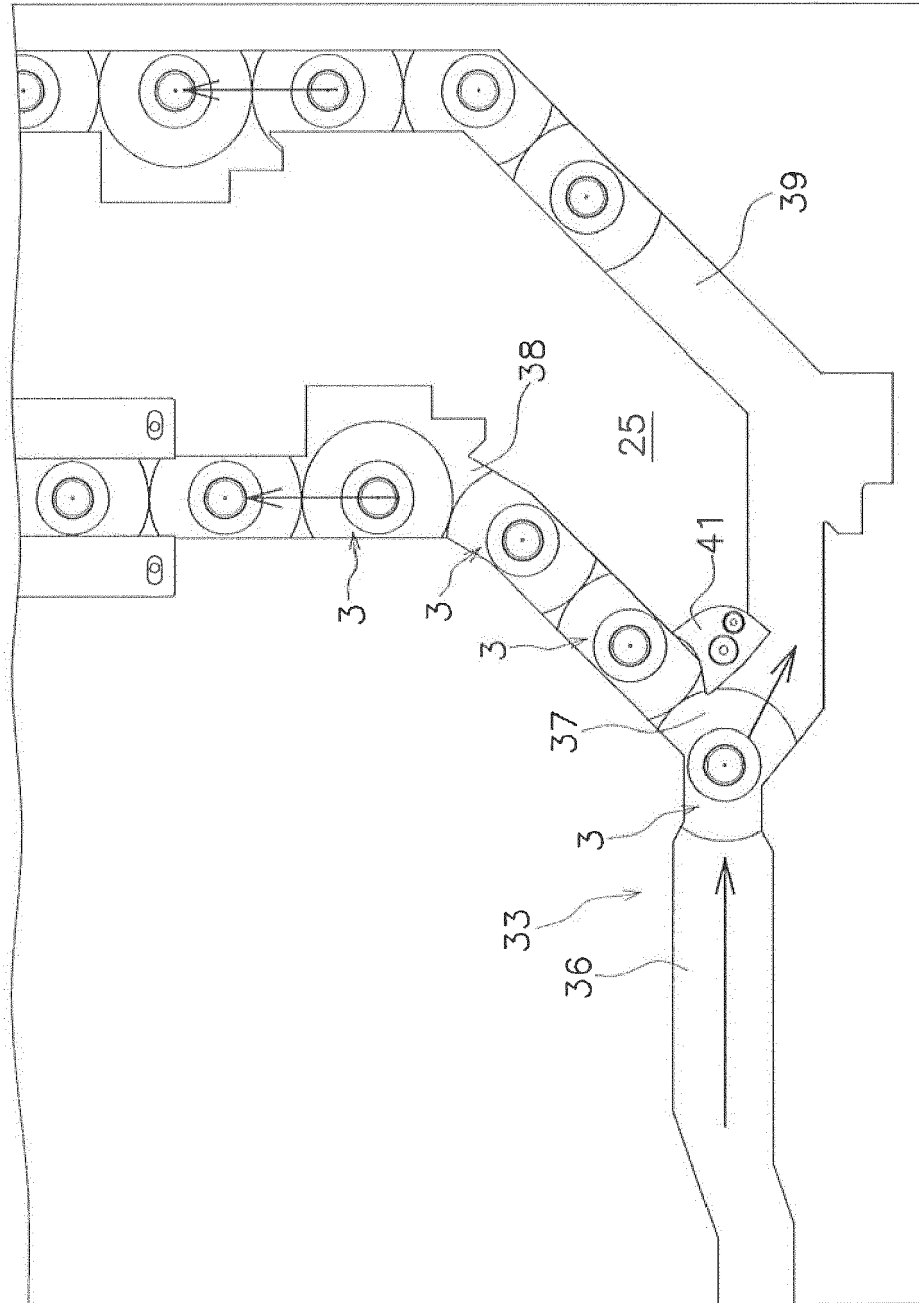


FIG. 18

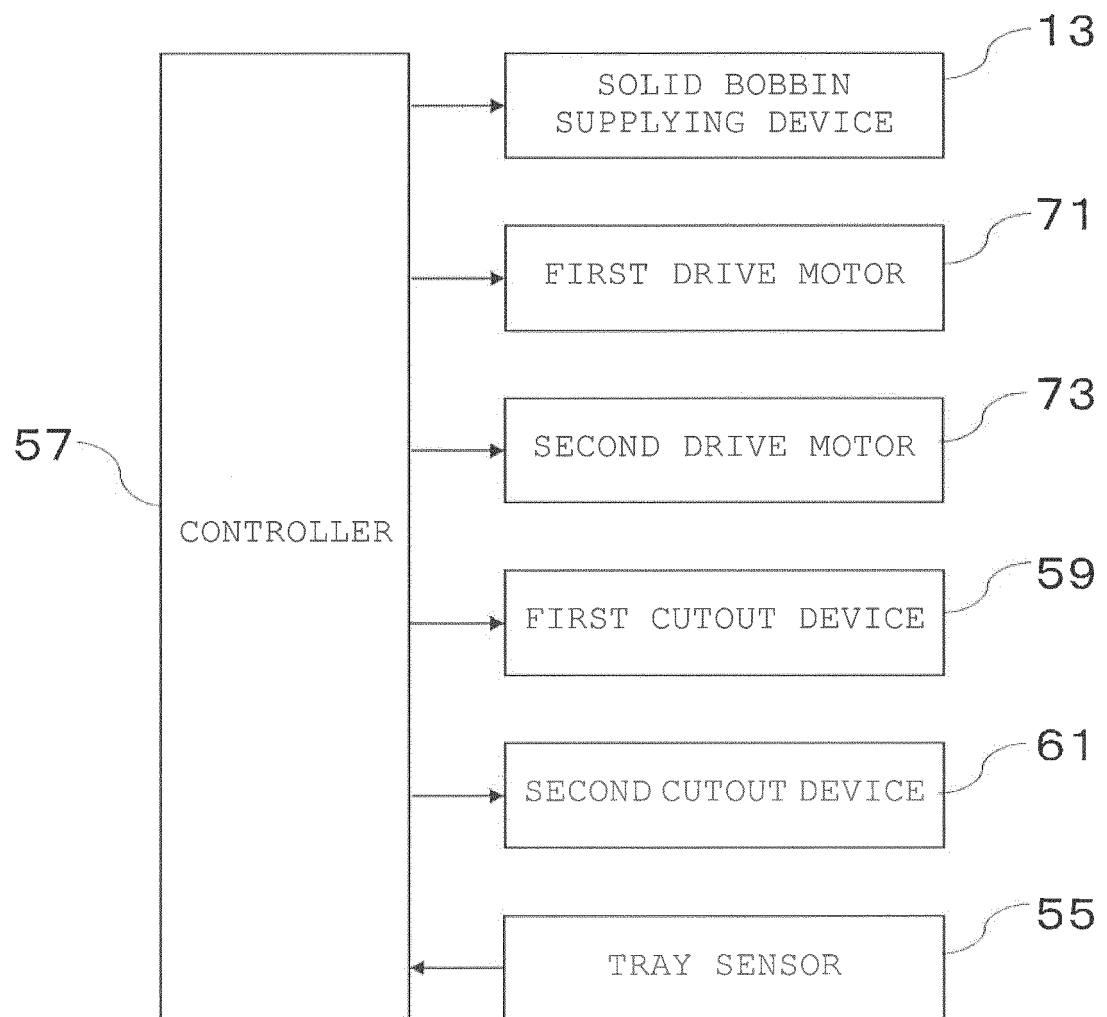


FIG. 19

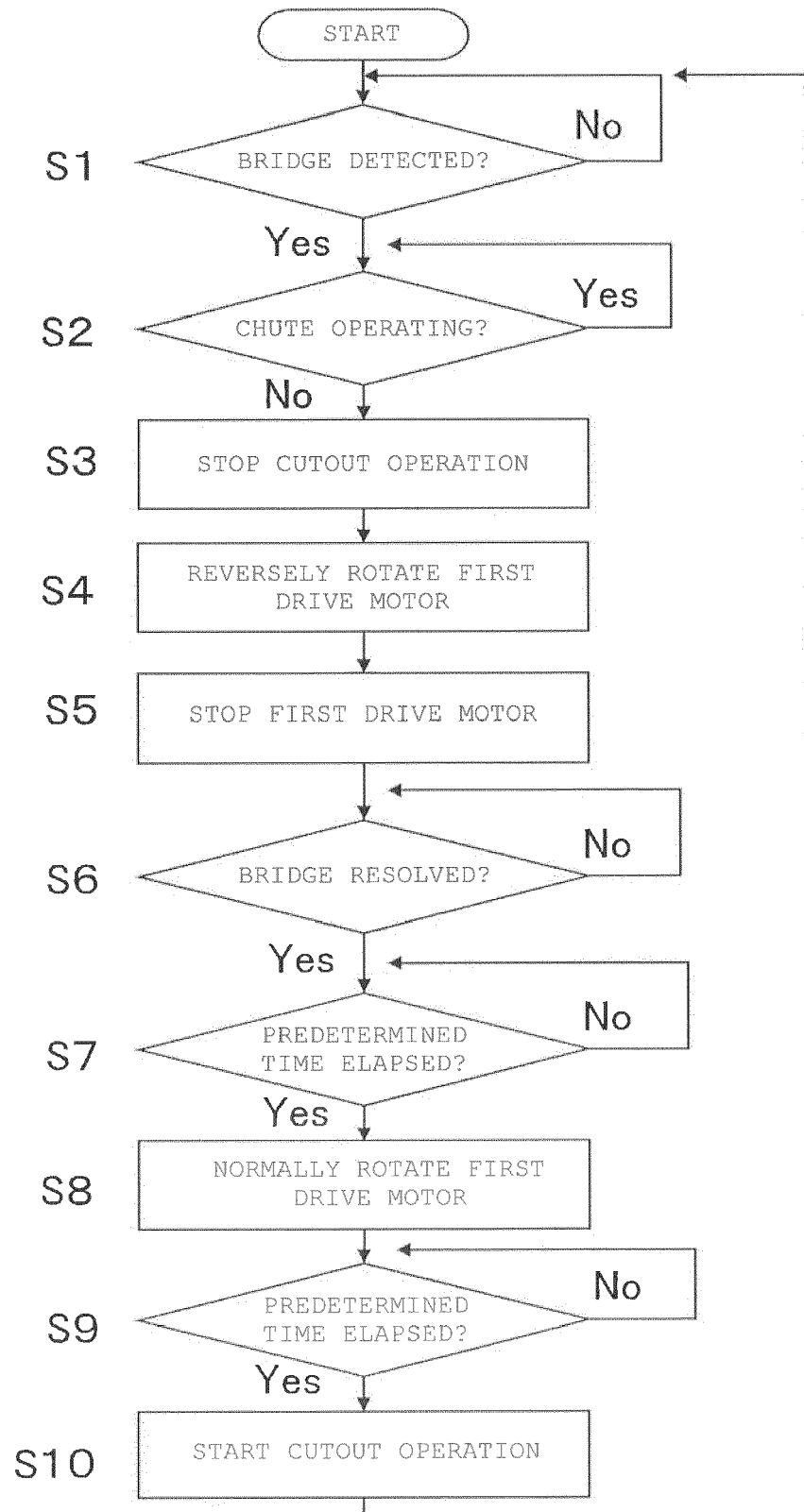


FIG. 20

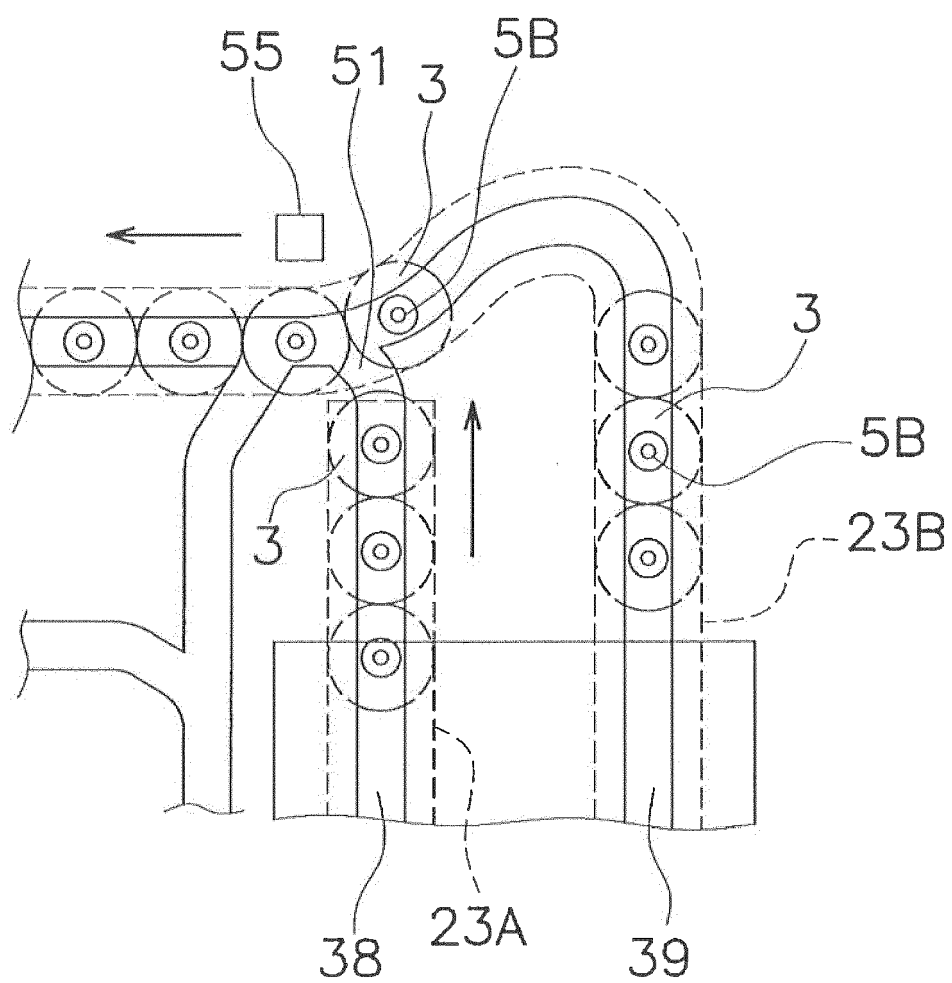


FIG. 21

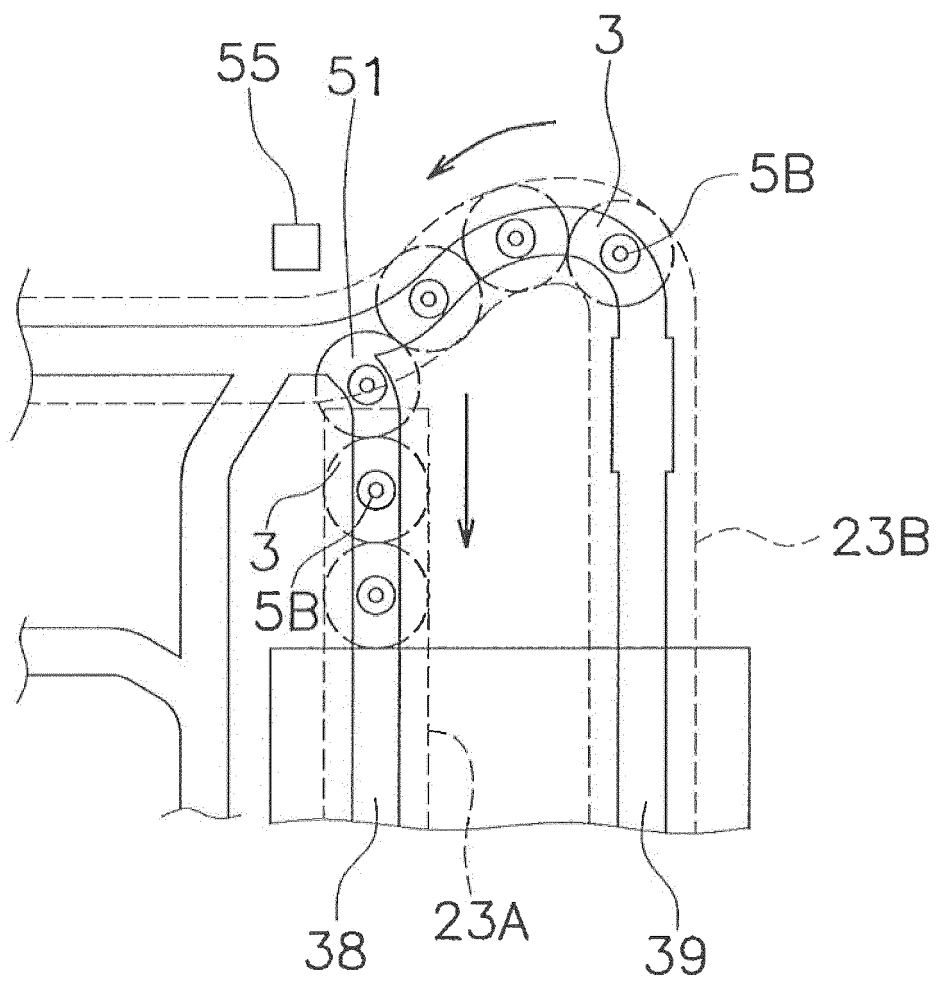
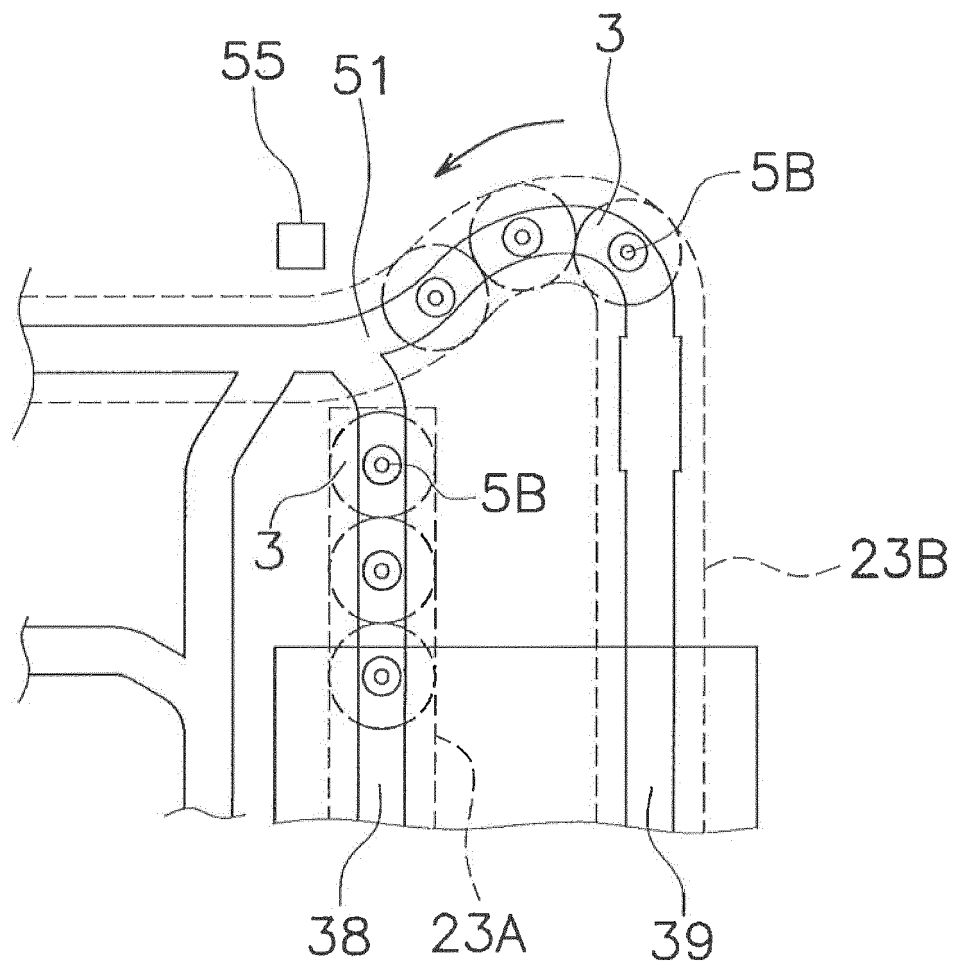


FIG. 22





EUROPEAN SEARCH REPORT

Application Number
EP 17 19 4396

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			B65H D01H
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 7 February 2018	Examiner Pussemier, Bart
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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